The CONTRIBUTIONS of the NEW PHYSICS to RELIGION

By

EDWIN E. SLOSSON

Director of Science Service,
Author of "Creative Chemistry"
"Sermons of a Chemist", etc.

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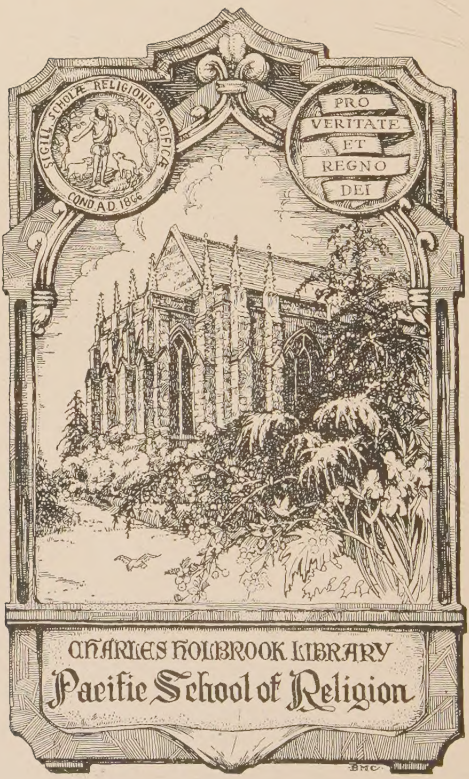
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An Address given in the Park Avenue Baptist Church, New York City, Sunday Evening, November 6, 1927

By

EDWIN E. SLOSSON

Director, Science Service, Washington, D. C.
Author of "Creative Chemistry," "Sermons of a Chemist," "Easy Lessons in Einstein," etc.

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EDWIN E. SLOSSON

OF THE AUTHOR

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Edwin E. Slosson hardly needs an introduction. Probably no one authentic scientist in America has done more than he has to interpret modern science to the public in clear and interesting language, not only as to its practical uses but also as to its deeper significances.

Dr. Slosson is director of Science Service, Washington, D. C. He is also the author of "Creative Chemistry," "Easy Lessons in Einstein," "Chats on Science," "Snapshots of Science," and other volumes. He was professor of chemistry at the University of Wyoming and chemist in the Wyoming Agricultural Experiment Station, 1891 to 1903; literary editor of *The Independent,* 1903 to 1920; and an associate in the Columbia University School of Journalism, 1912 to 1920.

His discussions of the relation between science and religion are intelligent and stimulating, devoid of superficial attempts at compromise, and —in the words of his statement regarding modern science—open "greater and grander vistas to the human imagination." While serving as elder or deacon in Presbyterian or Congregational churches, he has occasionally occupied the pulpit in the absence of the minister, and he has been frequently called to speak at college chapels. A collection of the discourses delivered on such occasions was published in 1925 as "Sermons of a Chemist." The address printed herewith was given at the invitation of the Rev. Dr. Harry Emerson Fosdick at the Park Avenue Baptist Church, New York, as the first of a series of three Sunday evening discourses on the relation of religion to the newer conceptions of physics, biology and psychology.

With the compliments
of the author
Edwin E. Slosson
Christmas 1928

The CONTRIBUTIONS *of the* NEW PHYSICS *to* RELIGION

Text: "Lo, these are parts of his ways; but how little a portion is heard of him?"
Job. 26, 14.

"Can you discover the deep things of God? Can you reach the Almighty's range of wisdom?"
"It is higher than heaven—how can you match it? Deeper than death—how can you measure it?"
Job. 11, 7-8. (Moffatt Translation)

IF the question that Zophar put to Job "Can you discover the deep things of God?" had been put to a scientist of the previous generation he would have been inclined to answer "Yes. Only give us time. We know already the fundamental laws of the universe and all that remains is to work out their details with greater exactness." Or to quote the words of an eminent physicist of the late nineteenth century "the future truths of physical science are to be looked for in the sixth place of decimals."

But if the question were put to a scientist today he would answer more after the manner of Job, "These are parts of his ways, but how little a portion?" For in the twentieth century the questions most hotly controverted are those very generalizations of matter and energy which the nineteenth century regarded as most firmly and completely established. The work of the nineteenth century was good as far as it went but the twentieth century scientist has dug deeper than before and has struck an unexpected vein of richer ore. With much more knowledge than his predecessors he has become more

modest in his claims. He is not so cocksure that he can explain everything on the materialistic and mechanistic basis. He has been confounded by running upon a lot of things that he cannot understand, and he is not at all sure that he ever can understand them. I will quote in evidence of this change two great living physicists, American and English. Professor Millikan of the California Institute of Technology, says, "Today physics is much more open-minded, less dogmatic, less disposed to make all-inclusive generalizations, to imagine that it is dealing with ultimate verities, than it was twenty-five years ago." Professor Eddington of Cambridge makes the same observation, "In considering the relations of religion and science it is a very relevant fact that physics is now in the course of abandoning all claim to a type of knowledge which it formerly asserted without hesitation." That is, "until recently physicists took it for granted that they had knowledge of the entities dealt with" such as time, space, matter and force. Now they are more ready to recognize that they have not reached reality, perhaps can not.

This is a very decided change of attitude, for the scientist of the former generation, while willing to admit that he did not know everything as yet, did not doubt that anything he ever found out could be fitted into the framework of his logical system. In other words, he assumed without question that the world was ultimately comprehensible to the human mind. But now Eddington takes quite the opposite ground and suggests that the latest theory of science, the quantum principle, may be the first real law of nature that has been discovered in physics. Why? Because it seems so rational? No, on

the contrary—because it is so irrational that it is not likely to have been invented. For a generalization like the conservation of energy is apt to turn out on close scrutiny to be but a concealed convention, a reflection of our own thought, like that "Great Law" that there are always three feet to a yard. Bertrand Russell says on this point, "This raises the somewhat important question: Is the world rational, i.e., such as to conform to our intellectual habits? Or is it irrational, i.e., not such as we would have made it if we had been in the position of the Creator?" It is curious to note that here Bertrand Russell comes strangely near a paradox of one of the early Christian fathers, which has often been held up to ridicule as the height of dogmatic folly and fanaticism, Tertullian's famous defiance of rationalism, *Credo quia absurdum est*, "I believe *because* it is absurd." Now we see this attitude of mind turn up again in scientific circles. Divested of their paradoxical language such statements in either case mean nothing more unreasonable than the modest admission that we have to accept a lot of things in science, religion and life that we cannot explain, and that it is a mistake to assume that we can unlock all the secrets of nature with a single key.

The new science is not only devoid of the arrogance of the old but affords a freer field to philosophic and religious thought than ever before. It opens greater and grander vistas to the human imagination. It may do more than this for it is already throwing new light on such age-old puzzles as the questions of causality, free will and determination, the relation of time and space, of past and future. Modern science is not only clearing away the obstacles which it had

itself placed in the path of a spiritual interpretation of nature but may even aid religion in the removal of some of its own difficulties. As one instance of how ancient controversies vanish when viewed from a higher standpoint let us refer to the case that has caused most trouble, that of Galileo. Freundlich, Director of the Einstein Tower at Potsdam, says that "it would be just as admissible to interpret the observed facts" by assuming that "all bodies rotate about the earth once in twenty-four hours" as that "the earth rotates about the polar axis once in twenty-four hours." So from the height of the Einstein Tower these centuries of persecution, distress and dissension seem both foolish and wicked.*

Nineteenth century physics reduced the world essentially to a concourse of colliding atoms. The atoms were regarded as the ultimate reality of all things, and their motion in the fixed framework of space and time was thought to be sufficient to account for all the phenomena of nature. Atoms in the common conception of the times were little round hard things, indestructible, uncreatable, immutable, driving about in all directions in straight lines, bumping up against one another and rebounding with perfect elasticity; all atoms of the same element absolutely identical like manufactured articles. This scheme made the interpretation of the universe a simple problem in elementary mechanics, for the atoms were subject only to Newton's three laws of motion. It seemed to reduce the problem of the interpretation of the universe to something simpler than a game of billiards, for in empty space there were no irregularities in the table cloth to interfere.

*I have discussed this point in my Sermons of a Chemist, p. 204-207.

Every event in the universe, past, present and future, could, it was assumed, be completely accounted for and predicted by calculating the movements of the individual atoms,—only of course you couldn't because they moved around so fast.

One conspicuous defect in a conception of the cosmos as nothing but atoms and motion is that it left out life. Quite an omission. There would be no room in such a world for anything mental or spiritual, no esthetic appreciation, no ethical aspiration. All that make the world meaningful to man were left unaccounted for, epiphenomena, unessential and uninfluential additions to the complete and logical universe of inanimate atoms. Pleasure and pain were equally aimless since man could do nothing in any case but look on and there was no reason why he should do that since he could not take any interest in the play for he took no part in it.

But this atomistic and mechanistic idea of the universe that seemed so solidly established at the end of the last century has received a series of shocks in the present century. First the discovery of radium proved that the atom was breakable, in spite of the fact that its very name denied the possibility. The atoms can no longer be regarded as immortal and immutable. They are in constant mutation. They have a life history. When next you visit Washington if you will come into the building of the National Academy of Sciences, where I work, you may see a sight that was thought impossible when you were born. You may watch the tracks of the fragments of exploding atoms of radium and see them smash up the atoms they collide with in their flight through the air at a speed of 20,000

miles a second. You may observe perhaps the transformation of one element into another, say nitrogen into hydrogen. The average birthrate and deathrate and expectancy of life can be worked with as much accuracy and certainty for radium atoms as it can be for the human beings by an insurance actuary.

I used the word "collide" but that is rather an old fashioned mode of expression. The "touch system" of mechanics is no longer in vogue. Nothing can touch anything nowadays. When an atom runs up so close to another as to feel its sphere of influence it does not bump against it but politely backs off, or else the party it encounters gets out of the way by dissolving or vanishing in a flash of light. Action at a distance was ruled out of the old physics because it was inconceivable. The new physics on the contrary seems likely to rule out everything except action at a distance. The idea is no more conceivable than it was in the eighteenth century but we are getting so that we do not mind that so much nowadays.

To those of us who date back to the last century and were brought up on atoms that were as round and hard as the pills of that day it was sufficiently upsetting to be introduced by Bohr in 1913 to his new model of the atom, which pictured it as a sort of solar system with a nucleus of positive electricity in the center and planetary electrons of negative electricity revolving around it in variable orbits. But after all this was merely a sort of miniature astronomy, such as we were familiar with and we could repose our confidence upon the electron as the ultimate unit, very much like our old atom only thousands of times smaller.

But we are not allowed to stop with such a simple and tangible conception. The solar system model though useful proves inadequate, and now we see the solid atom in the process of being reduced to a mere potentiality of resonance, or to a statistical probability. Modern thinkers like Heisenberg virtually abandon all attempts to present any picture of the movement of electrons in time and space. As we know nothing of light in transit, since we can only observe its effects when the ray leaves or reaches some material object, so also we know nothing of an atom in itself, since all we know is what comes out of the place where it is supposed to be.

With the introduction of the quantum theory physical science approaches sociology. Formerly the chemist looked down upon sociology as an inferior science, doubtful indeed if it could be entitled to the rank of a science, because the statistician can only predict the movements of multitudes of men in a period of time but not of any particular man at a certain time. He could say with great certainty that of a thousand persons in New York City between twenty and twenty-one will die next year and between ten and eleven will marry. But he cannot tell with any such assurance which one will die and which will marry even if he had determined to kill some man or marry some woman during the year. But the chemist could not only predict with great accuracy the movements of multitudes in masses but he believed that he could also predict with equal accuracy the movements of any individual molecule. But since the molecule was too small to be seen, and too fast to be followed, if it could be seen, the physicist never had a chance to prove his powers of prediction by the

test of experiment. The chemist had the great advantage over the sociologist in that he could deal with larger numbers. The chemist uses the cubic centimeter as a unit in the measurement of gases, and if he gets it down to a cubic millimeter he thinks he is doing a fine job. But this minute space, smaller than a pinhead, contains some twenty million times the entire population of the world. Give the sociologist carefully compiled statistics of twenty times the population of the world and he too could match the chemist in closeness of prediction. For whatever degree of free will you may ascribe to men as individuals they show no signs of it when you take them in the mass. The rate of death which is usually involuntary can be calculated with no greater certainty than the rate of marriage which is supposed to be voluntary, at least in part. Or if you prefer, you may ascribe as much free will to molecules as to men, using free will in the sense of arbitrary and unpredictable actions of individuals.

At any rate it is now becoming recognized that many of the general laws of physical science have no more absolute validity than statistical statements. They deal with probabilities, averages, net changes, trends and mass movements, and are not applicable, or at least they cannot be applied, to the determination of individual activities of bodies too minute to be directly observed. You may for instance measure the flow of a stream as passing at the average rate of five feet per second, but that does not take into account the minor turbulences of the current. If you look more closely you may see a chip being carried upstream by an eddy in apparent defiance of your law that the water

flows downhill. Nevertheless your law holds on the whole and your measurement is not thereby invalidated. So too the physicist can tell with great accuracy how many out of a given number of atoms of radium will explode in a second and fire off a helium fragment. But he cannot tell just which radium atom is going to go off next. Nor is he quite so positive as he used to be—and here lies the recent change in the point of view—that he could tell just what the radium atom was going to do even if it were enlarged so he could hold it up in his mind and watch the 88 electrons circling in their orbits around the nucleus like planets around the sun. His mathematics fail him when he gets down to infinitesimals like this and the new quantum formulas give him only probabilities of action in the aggregate. The figures of the new physics are marvellously accurate and the certainty of prediction no less for the whole, but there is a certain haziness about the field of view when it is brought to bear upon the ultimate individuals. You may maintain if you wish that minutest units, molecules, atoms, electrons or quanta obey the laws of the classical mechanics as rigidly as do planets or billiard balls, but you cannot find proof of this either in experiment or theory.

Of course any uncertainty in the foundations will render the structure unstable all the way up. If we allow a single electron to jump its track without due cause, perhaps in some strategic neurone of the brain, it might affect the career of the man and alter the fate of a nation. It is the principle of causality, formerly assumed as the indispensable foundation of all science, which is now being called in question.

This is no new point. Jonathan Edwards saw

clearly that his Calvinistic theology was, like the Newtonian mechanics of the universe, dependent upon every atom doing its duty in that state into which it hath pleased God to call it. In the chapter entitled "Of God's Placing differently Similar Particles" published in 1754 shortly before he was called to become president of the College of New Jersey, he proves that a displaced atom might in the course of time alter the revolution of a planet, and

> "So the Influence of the least Particle may, for ought we know, have such Effect on something in the Constitution of some human Body, as to cause another Thought to arise in the Mind at a certain Time, than otherwise would have been; which, in Length of Time (yea, and that not very great), might occasion a vast Alternation thro' the whole World of Mankind."

It is not customary nowadays to cite Edwards in sermons but I have quoted this passage because it shows that the physical foundation of the Calvinistic theology was the Newtonian mechanics. If now the Newtonian mechanics is dethroned by Einstein what effect will that have upon the form of faith, the political policy, the industrial ideals, and the manner of life that have been developed by that theology?

Free will or foreknowledge, Arminianism or Calvinism, has divided Methodist from Presbyterian, and formerly split the Baptists into a Calvinistic and Free Will sect, and it is only within our generation that each party has in the main consented to sit together at the Lord's supper with the party which holds erroneous views on this question, and even to include those who are so weak of will or inert of intellect as to have no opinion upon this vital point.

I do not venture to surmise which side of this historic controversy the new physics will eventually be found to support. In its present state of development it appears to provide new arguments on either side, for determinism and for chance, from which we may infer that it may harmonize these hitherto irreconcilable views. But it will take a generation of philosophers and theologians to work out the metaphysical bearing and the ethical applications of the physical theories recently revealed to the world. Here I merely suggest that this old question must now be reopened for the reception of new evidence.

It is at any rate curious to see that the question which has torn Christendom in two should be fought over in the field of the exact sciences. It tends to confirm the opinion, often expressed by theologians and philosophers, that the reason why men of science were not bothered by the persistent problems of metaphysics was because scientists had accepted uncritically a superficial materialism and had not gone deep enough. Well, they are going deep enough now. Einstein and Planck, Schrödinger and Heisenberg, are forcing upon physics the fundamental questions that have been fought over for twenty-five centuries in the field of metaphysics.

In fact our traditional notions of time and space seem to be inadequate to fit the new facts. What can take their place it is too early to say. It seems to me a sort of motion picture philosophy. When you go to see the motion pictures you never see motion at all. You sit half the time gazing at a blank black screen. But sixteen times a second a still picture appears and you piece these together without noticing the blanks of time and space between and you call it con-

tinuity. The reason why the motion picture looks so much like the real world is because you see the real world in the same jerky fashion with unseen intervals between. You may think that you read a line of print continuously but you deceive yourself. You actually stop and look at a few words, and then you move on and stop to look at another group. Your conscious life is intermittent. Your consciousness is suspended every night for several hours, if you are a sound sleeper. The universe might be annihilated and regenerated without your knowing it, not only while your eyes are shut at night, but also for briefer periods while they are open. So if a physicist of the future should call upon you to admit that the external world is merely a succession of events, and that time and space are not continuous but rather like dotted lines, you can calmly reply to him "That is how they have always seemed to me."

I mention this because people are inclined to take a fright at the strange ideas advanced by science and to take refuge from novelty in the older forms of thought to which they are accustomed. Jonathan Edwards says that in his day men were appalled by the thought of the immense distances of the stars disclosed by the telescope of Galileo and the theory of Newton, and, as he says, they "are almost ready to fall back into the antiquated Ptolemy his system, merely to ease their imagination." So I think that it is mostly "to ease their imagination" that many are now disposed to revolt against the new conceptions of physical science, and to exclude Einstein as well as Darwin from the schools as dangerous to faith and morals. When the new ideas become customary they seem no

longer absurd but more simple and natural than the traditional notions, and they turn out to be helpful rather than harmful.

The tendency of the times in scientific thought in our time is toward the unification of the universe. Fragmentary facts are falling into fit places in the general scheme of things, like the letters in a cross-word puzzle when you are nearing the end. The ninety known chemical elements, which at first appeared to be absolutely distinct and unrelated individuals, are now shown to be logically connected in structure and some are transformable into others. Gravitation which has been hitherto an inexplicable oddity among the natural forces has been brought by Einstein into relation with the rest. Matter and energy, apparently so unlike, are proved to be interchangeable. Time and space are now treated alike by the mathematicians. Past and future are commingled in their formulas. What we used to think were the peculiar properties of the individual particles of matter, prove to be dependent upon the universe as a whole. Even mass and size appear to be purely relative. Inertia was formerly regarded as one of the absolute and inalienable properties of all matter. Einstein says that a single particle of matter standing alone in empty space would not have any inertia. Would it have any size? Eddington says a lone electron could not know how large it ought to be unless it had the universe around to measure itself against. That is, each atom derives its existence from the all. As the theologians would word it, nothing can exist apart from God.

When the theologians say that God is omnipresent and yet at one particular spot they are

saying no more than physicists say of the electron. Professor Lewis of the University of California in his recent lectures at Yale on "The Anatomy of Science" used those very words: "Each electron exists everywhere." The point where the electron is supposed to be is merely the center of its field of force, its sphere of influence.

Here is another statement that sounds like a mystical paradox. It is that the emission and reception of light are reciprocal processes, neither possible without the other. We readily admit that the eye cannot see a certain star unless that star had long ago sent out a ray of light in a direction so as to reach the eye at this particular place and time. But it is startling to be called upon to reverse the rule and say that the ray could not be sent out by the star unless the eye or something else were ready to receive it. The eye and the star may be a thousand light-years apart yet they are in virtual contact, or to quote Professor Lewis's own words "I claim that my eye touches a star as truly as my finger touches this table." That this involves the principle that we can affect the course of what we call past events is not in his opinion a reason for rejecting it. Nor was this interaction of past and future regarded by Calvin as an objection to his system of theology.

When Peter in his vivid picture of the day of judgment says that the earth and stars shall be burned up and the elements shall melt with fervent heat he is using poetic and metaphorical language which should not be taken literally. Yet it is not extravagant, and the modern astronomer would go even further for he holds that the stars all the time are quite literally dis-

solving in a blaze of light and that their elements are melting away *into* fervent heat. The light and heat of the stars are now thought to come from the annihilation of matter. Our sun is estimated to be losing four million tons of matter a second by dissolution into immaterial rays. But do not fall into the error of supposing that "science has proved that matter does not exist." We do not abolish anything when we explain it. Though the physicist may reduce the atom to a mathematical probability of wave harmonics a stone is still heavy and steel is still sharp, and the stone will bruise and the steel will pierce as in the days when we were more ignorant. We do not change nature when we change our mind. But the more we know the more we can control nature.

I am not bringing in references to ecclesiastical dogmas and biblical quotations in order to substantiate the creeds by the current theories of science nor to establish a claim for priority of scientific discovery by the authors of the Bible, but merely to show that the ideas and analogies conceived by great religious thinkers for their special purposes are often strikingly similar to the language hit upon by men of science in their effort to express fundamental principles from their very different points of view.

Scientific laws exist nowhere except in the minds of men, and not in many of them. Our scientific theories, theological dogmas and philosophical systems are, like our commonsense conceptions, merely attempts to express in simplified and symbolic form a universal reality so vast and complex as to be essentially incomprehensible to the human mind directly and in its entirety. All such conceptions of the world are inevitably

inadequate and defective, often indeed contradictory because presenting opposite aspects impossible to include in a single viewpoint. If we refuse to regard these conflicting views as permanently irreconcilable, it is because we have a greater faith in the ultimate unity of the universe than our reason can justify.

Much of this continual controversy between religion and science comes from the use of such words as "law" in different senses by the opposing parties. Our theology was first formulated in monarchical ages and so speaks a language alien to the conceptions of modern democratic science. The best peace maker would be a bi-lingual dictionary, for it would show that the contestants had more in common than they think.

When we talk about a "revolution" in science or of the "overthrow of a law" we are using metaphorical and misleading language. A scientific revolution is merely a change of mind. (Perhaps that is true also of political revolutions). It usually leaves the facts and figures in the textbooks quite unchanged. The scientist very rarely has to take back anything but he has to keep making over everything.

The carrying over of that unfortunate word "law" from politics into science has caused an infinite amount of misunderstanding. "Law" in science does not mean a command or ordinance. Consequently a scientific "law" can never be "disobeyed," "violated," "evaded," "reversed," "suspended" or any of those things. As Dean Inge of St. Paul's Cathedral says in his "Scientific Ethics":

> "Perhaps nothing has corrupted the Christian religion so profoundly as the unethical magic which in many different forms has pervaded it; and it all rests upon the

assumption that there is a 'supernatural order' which from time to time 'suspends' the laws of Nature, breaking the natural sequence of cause and effect."

The confusion has been made worse by including theories and hypotheses under the term "law." A theory or hypothesis is either a law on probation (like a bill before the legislature) or, more often, a mental picture or mechanical model that makes the idea easier to grasp. There is therefore no inconsistency in discarding one hypothesis for a better one, or even in holding two irreconcilable hypotheses at the same time, if neither alone is adequate. A law in science is simply a description in the fewest possible words of what happens. It is a succinct summary of all that is known on that subject at the time it is formulated. It is not so much a discovery as an invention.

Professor Eddington of Cambridge, professor of astronomy, expresses the new viewpoint of natural law most forcibly:

"The conclusion is that the whole of those laws of nature which have been woven into a unified scheme—mechanics, gravitation, electro-dynamics, and optics—have their origin, not in any special mechanism of nature, but in the workings of the human mind. 'Give me matter and motion' said Descartes, 'and I will construct the universe.' The mind reverses this. 'Give me a world —a world in which there are relations—and I will construct matter and motion.'

"We have found that where science has progressed the farthest, the mind has but regained from nature that which the mind has put into nature. We have found a strange foot-print on the shores of the unknown. We have devised profound theories, one after another, to account for its origin. At

last, we have succeeded in reconstructing the creature that made the foot-print. And Lo! it is our own."

My conclusion is that the real danger in the advance of physical science is not theological but ethical—not in materialism of science, but the material gifts of science. It is the danger arising from the sudden acquisition of power. If, for instance, every person in this country should be given thirty slaves to work for him day and night, how would his morals stand the strain? Without considering his treatment of his slaves, what would he do with the wealth, leisure and freedom of action with which he had been suddenly endowed? Well, we can see by looking about us, for that is essentially what has happened during the last two generations by the utilization of fossil fuel. Man has quadrupled his income by drawing wealth from the coal banks. This multiplies the power of mankind for good and evil. If a boy wants to play hookey today he can run away from school at the rate of fifty miles an hour in an automobile. If a girl wants to dance all night she can have an orchestra at her disposal by turning on the radio or phonograph. If a man is disposed to dissipation he has four extra hours a day to indulge in it. If a woman is inclined to extravagance and idleness she has more money and time to waste in that way than a dozen of her foremothers. If a nation wants to go to war it can kill a million men and destroy a billion dollars worth of property in a year.

No previous generation in all history has been subjected to such a strain. No other people in the world is led into such manifold temptations as ours, for no other is possessed of such personal

power. The question on which the fate of the world depends is whether the human race has the moral stamina to withstand such unprecedented powers as have recently been placed in its unpractised hands. When we read of the cruel acts, reckless extravagance, and wanton follies of a Roman emperor or a Great Mogul we say, "Well, such wickedness is naturally to be expected when a man is elevated into a position of such power." Let us hope that such evil propensities are not "natural" for applied science has elevated the ordinary man of today into a position surpassing in power any wielded by a Caesar or sultan of old. As the world becomes more crowded people have to behave better just as they do on a street-car. I do not suppose that any man can now be any wickeder than were men before the Flood but a wicked man can do more harm than he ever could. In New York City a malevolent beggar with a bomb in his hand or a selfish stockbroker in control of an indispensable commodity can wreak more ruin in a moment of carelessness or evil impulse than a criminal of the ancient world could in a lifetime. In all ages some men have been as bad as they knew how to be but in our time sins have become more stupendous and spectacular than was possible before. The vices of our day tower like our skyscrapers and for the same reason—because they can. A wicked or unwise act is magnified and multiplied by the magic of science. In the Agora of Athens a prejudiced popular vote might banish a useful statesman or put to death a great philosopher and so do serious injury to the city. But a similar irrational ballot in the United States might bring financial ruin upon a hundred million people or cripple the education

of a generation of children. In the days of Molière a corrupt comedian might by a leer at lust or a sneer at virtue stir evil thoughts in the minds of the few hundred persons in the theater. In our day he would have a chance to do the same injury to ten million a day in the movies.

An unmanageable horse in a country road can do but little damage at his worst. A mismanaged automobile of 80 horse-power in a city street is bound to cause a catastrophe at the best. The American people are now driving a team of 200,000,000 horses abreast, day and night in their power plants. No such feat has ever before been attempted, no such risk has ever before been run. In handling such a team a minor miscalculation of the course or a moment's carelessness in control may be fatal. Vice and ignorance that in former times injured nobody but the individual himself have now become of serious concern to the entire community.

Of course the potentialities of good influences and wise counsels are multiplied and magnified in the same proportion, and I cannot say whether they have kept pace with the evil possibilities. The question of whether the world is growing worse or better must be left to those who are more skilled than I in reading the ethical thermometer. But I think I am safe in saying that neither vice nor virtue has yet made full use of the new possibilities opened to it by modern science.

There were in former times men as saintly and self-sacrificing as any now living, yet never could they carry out their benevolent impulses on such a scale as they can today. I do not know that Herbert Hoover is any kinder hearted than Sir Launfal, but while Sir Launfal saved the life

of a beggar by sharing his crust with him Mr. Hoover saved many thousands from starvation through his relief work in Europe during and after the war. Walter Reed was probably no more willing to devote his life to the relief of the sick and suffering than many a medieval monk but Major Reed was able to save untold lives by his proof that yellow fever is carried by mosquitoes. I do not know if the pastor of this church is a greater preacher than any in the nineteen previous centuries of the Christian Era but I do know that he has a greater congregation. This morning when Dr. Fosdick preached here some seven hundred people heard him, all who could get into the church. But this afternoon when he preached by radio his auditorium covered half the continent and millions may have listened to his message.

The power of a personality to do good or harm has been immeasurably increased by modern science. There is all the greater need that the actuating purpose shall be right and wise. Each advance of science makes the need of religion more necessary. Science can only provide the motive power. Religion must supply the motive.

THIS PAMPHLET

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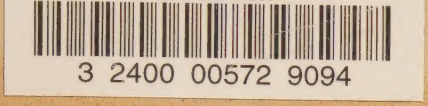
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